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his philosophy of religion; and the seventh, the nature of his genius as a thinker and the range of his influence as a philosopher and teacher.

The spiritual influence of the character and writings of Emerson is strongly emphasized. Mlle. Dugard regards the idealism of Emerson as one of the most potent contributions of America to modern thought. In this she likens him to Plato; and like the great Greek philosopher, she believes that he is one of the few great writers to whom future teachers will continue to revert for inspiration and direction. Emerson's strong individualism is emphasized and his great influence in this direction on the best tendencies of American civilization.

While recognizing the detached character of his forms of thought, she holds that he is eminently consistent as a thinker and that apparent contradictions are mere matters of interpretation. His foreshortened esthetic sense, and particularly his lack of interest in music and his deficiency of emotional warmth, are critically discussed and deplored. It may well be asked whether the author has made as careful a study of Emerson's poetry as she has of his essays. Surely the poems teem with the highest emotional reactions.

Students of philosophy and education in America owe a large debt of gratitude to Mlle. Dugard for this scholarly and exhaustive study of one of our first spiritual teachers. Her work has been carefully done, and shows not only intimate acquaintance with Emerson's writings, but familiarity with the entire field of American history and letters.

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The Raccoon: A Study in Animal Intelligence. H. B. DAVIS. *American Journal of Psychology,* October, 1907. Pp. 447–489.

The paper consists of two parts: (1) general observations of the habits and instincts of adult raccoons, and (2) an account of experimental work. The results of the latter portion only can be reviewed here.

The animals were allowed to unlatch the fastened door of a box, *enter* it and get food. Single fastenings, a "group" of two buttons, the same plus a vertical gate-hook, and, finally, two combination locks, each constructed of four of the previously learned single fastenings, were used. The combination locks demanded that their elements be operated in a fixed order.

Though no names (save imitation) for the animals' methods of learning are employed, the general impression given the reader is that Thorndike's experiments with cats have been confirmed in detail and that the raccoon's learning conforms to the trial and error type. Chiefly effective in conveying this impression are the following conclusions: The experiments show variety of attack at first and a single stereotyped method at the last for each animal. "The perfecting of the power of undoing fastenings is accomplished by a slow series of small changes consisting chiefly in the omission of unnecessary movements and the combination of those required. Experience with former fastenings holds over in the case of new ones, leading the animal, at least in certain cases, to begin his attack at the place on the surface of the food box where he has been accustomed to work. (This has been found by Thorndike in the case of cats, but denied by Cole for raccoons)" (p. 486). Elsewhere the method of working the latches is described as a "tendency to the formation of a 'short circuit' by the elimination of useless movements." These conclusions are confirmed by the facts that no clear cases of imitation were found and that the deliberate behavior of the older raccoons corresponds with that of older cats. Add to this the facts that no tests of putting the animal through an act were made (no evidence appears that the animals could be handled at all by the experimenter) and that, as the experiments were arranged, an act was always, objectively at least, a necessary element of the association, and we see how forcibly the impression of trial and error learning is conveyed to the reader.

Consideration of the further results of the paper may indicate, however, that the trial and error learning did not occur theoretically pure. For "the learning curve for the raccoon follows closely the type of those found for the higher animals and *for man*" (p. 477). The latter fact was proved by giving combinations 1 and 2 to boys and girls to learn and plotting the curve. And the "curves for raccoons and for Kinnaman's monkeys seem to show a *nearly equal facility* in learning to undo fastenings." As this rate of learning is very different from that of cats, it deserves further comparison. Were the raccoons hungrier than the cats similarly tested? No, they were moderately hungry (pp. 463 and 465); the cats were "utterly" so (Thorndike, p. 6). Which animals are physically quicker? This is like asking which is physically quicker, a tiger or a bear? The rapidity of the learning discovered seems, therefore, partly a mental affair. Or, if not partly mental, then the raccoons learned by the method of the cats, which possibly have "*no images or memories at all*"[1] (Thorndike, p. 73), nearly as rapidly as monkeys which exhibit "at least a low form of general notion" (Kinnaman, p. 148). Not only this, but Mr. Davis has most carefully shown "that the order of procedure in working the combination locks was perfected before the amount of effort necessary was fully learned" (p. 486). Hence the raccoon learns "order" and "amount of effort" at two somewhat different rates in the same experiment. No doubt this may be due merely to the structure of the locking device. Had it been less difficult the manipulation might possibly have been perfected first and the order second, but even in that case the two rates would indicate that the learning was a complex, not a simple, process. It seems that with this experiment Mr. Davis has opened a field worthy of further investigation. Finally, the raccoons seemed to reach a sort of "*generalized* manner of procedure" which enabled them to deal more promptly with any new fastening, and there was an evident ability to respond to small differences in complex relations.

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[1] Except in this case, the italics are the reviewer's.

The first of these groups of facts shows, then, that the raccoons learned by trial and error, while the second may indicate to the careful reader that some other factor also was present.

During the short periods of no practise the raccoons showed a gain in the facility with which they operated latches. This observation seems, to the reader, to be a neat laboratory verification of the remark quoted by James that "we learn to swim during the winter and to skate during the summer." Memory for combination locks was imperfect after a period of 286 days, but relearning was rapid.

One raccoon, having caught one of her toes between the vertical hook and the side of the food box, always thereafter released the hook with her nose. This interesting observation seems to support Yerkes's opinion that pain is, in some cases, a better stimulus than hunger.

An excellent table is given of the first forty trials of raccoon No. 1 with the single fastenings and groups. The generalized curves, however, are too much reduced and of the too common type which, if read accurately, must be copied on tracing paper and transferred to cross-section paper to determine the ordinates of any given trial. They readily give, however, a general notion of the time required for the learning process and show an interesting difference from monkeys, for which a like curve is given.

So far the experiments with fastenings. Experiments made to test the color perception of the raccoons seemed to indicate that they did not discriminate colors as such, but depended on differences in brightness alone for their successful reactions. The tables given tend to confirm this opinion or to show at least that discriminations of brightness are considerably easier for the animals to make than discriminations of colors.

The method employed for these tests, however, is open to serious criticism, for, with the first piece of apparatus used, the raccoons could both look into and reach into the vessel which contained the food and into the five similar vessels which were empty. The experimenter must have felt this disadvantage, for the second piece of apparatus "*did not allow the animal to look into the container in which the food was placed*" (p. 479), but the food could be secured by reaching through an opening 2″ by 1½″ in the vertical slides. The food was placed "under" one color, and when this was moved to a new position every other color was given a new position also. Thus with the second testing device each container could be explored by touch. If the animal reached into a no-food vessel, an error of color discrimination was recorded against him. There seems, thus, no means of distinguishing true errors of color discrimination from the cases in which the animal paid no attention to the colors at all, except that brightness tests gave better results than color tests. "The two pieces of apparatus were used indifferently."

The first piece of apparatus is almost identical with that used by Kinnaman with monkeys. The reviewer has used this apparatus with raccoons, and found that apparently they *could not pass a single food container without both reaching into it and looking into it.* Instead the animal would go to one end of the row of vessels, explore the first one carefully by both touch and sight, then the next, and so on until the vessel with food in it was found, and then go on in the same way to the end of the row and then back again, rarely skipping a single vessel. Adult animals, such as Mr. Davis describes, skip more of the vessels, for one was considerably *above chance* in the color tests, and instead of 17 per cent. (chance) the brightness tests gave an average of 52 per cent. of right choices, while the best record of thirty brightness tests gave 96 per cent. of right choices. This marked difference between the average and the ability of one animal as shown by his best record may, perhaps, indicate the presence of a factor tending steadily to reduce the average of right choices, especially since brightness discriminations are not very difficult for the raccoon to make. However this may be, the raccoon has a strong instinctive impulse to investigate every opening by both touch and sight. Any one who has seen a hungry raccoon stop working for food to explore the trainer's pocket, and finally have to be torn away from it by force, will understand how apparently overpowering is this impulse to explore all openings by touch. One's cuff, foot of trousers leg, pockets, half unbuttoned coat, and all the feeding vessels were fatal provocatives of this reaction. Many mistakes in selecting the food container occur, therefore, because the animal can hardly pass by any container without exploring it. Since there is no difficulty in arranging apparatus so that the animal must select the vessel before he can either look into or reach into it, the influence of instinct in making the tests inconclusive could have been eliminated. Yerkes has shown, in the case of the crab, that a test which runs counter to a strong instinctive impulse is unsatisfactory.

No certain cases of imitation of one raccoon by another were observed, and while such cases "remain few and uncertain, we may well entertain reserve as to those where the raccoon seems to imitate the experimenter." Cole's explanation of such acts by raccoons is criticized and another proposed in which "accident," "inveterate impulse" (the instinctive impulse to claw at loose objects, we must suppose), and "association" are the words which are made to share, perhaps equally, in bearing the burden. To which it may be briefly replied that accident it was not, that the raccoon certainly has such an instinct, but the reaction in question is not an example of it, and that "association" is quite probably the proper word—but association of what? Since Thorndike's word "association" may be said to be, psychologically, a noun which requires an object. Used in the abstract the term explains nothing, but since association of a visual with a gustatory image is denied, the term, as used by Mr. Davis, must mean association of a motor impulse with a given situation, "stamped in" by trial and error alone. This explanation will not account for Cole's results since an *act* was not a necessary element of the association, but was merely a test of the presence of an association already formed, an association, too, between sensory impressions or images of sensory impressions.

When a bolt at the left of the door of the food box was removed raccoon No. 5 "nearly wore himself out trying to push something from the place where nothing was present" (p. 467). In his scramble to do this he assumed the position of standing on his head, from the fourth to the eighth trial. Cole is quoted as saying that his raccoons "did not paw at the place where the loop had been nor did they claw at the loop or button when the door was open." On the evidence of the behavior of this raccoon No. 5, therefore, Cole's results are denominated as "*exceptional.*" The answer to this criticism is arithmetical. Cole's animals did claw at the side of the door where a latch had been *exactly six times* (Cole, p. 218). Now compare this number, six, with the thousands of trials in which no such thing occurred. What is the ratio? Or which is the exception and which the rule? Truly it is a startling experience to see a raccoon stand on its head, even four times. Yet the vividness of the experience must not be allowed to blind us to the evidence of our numerical records. Otherwise anecdotes would be as valuable as recorded tests in animal psychology.

Mr. Davis secured one animal which was blind, or nearly so. It is to be hoped that the sense of touch will be carefully tested in this animal for the opportunity is unique, and in this case no cruelty can be charged in blinding the animal.

It seems to the reviewer that in attributing to the raccoon a nearly equal facility with the monkey in learning to operate fastenings, the former animal is rated considerably too high. For Mr. Davis included in the recorded time only "the entire period during which the animal was *in contact with the locking device*" (p. 465), while Kinnaman counted the time "no matter whether the monkey was before or behind the box, whether prancing around it or jumping up and down on top of it, so long as he was trying to open it. Some of these efforts were in nowise directed toward the latch" (Kinnaman, p. 115).

Though all the raccoons tested by Mr. Davis were fully grown, or nearly so, he found considerable difference in the behavior of the younger and older individuals.

Notwithstanding differences of opinion as to the interpretation of results, which differences seem inevitable and which future experiments will settle, Mr. Davis has given us a valuable and permanent contribution to the data of comparative psychology. With indomitable purpose he has overcome most serious difficulties both in securing raccoons and in carrying out the experimental tests. In addition to the immediate value of his results, they should attract other workers to investigate the problems which he has shown to be worthy of further study.

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